IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: HOWLAND, Charles A. et al Group Art Unit: 1733
Serial No.: 09/943,750 Examiner: Fischer, J.
Filed: 08/30/2001 Docket No: W0490/7026 RJP
For: TIRE ANTI-PUNCTURE PRODUCT

24222

To: Mail Stop
Commissioner for Patents
PO Box 1450
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CERTIFICATE OF MAILING 37 CFR 1.8: I certify that this correspondence is being deposited on the below date with the U.S. Postal Service with sufficient postage as FIRST CLASS MAIL addressed to: Mail Stop Non-Fee Amendment, Commissioner for Patents, PO Box 1450, Alexandra, VA 22313-1450.
[ ] Debra A. Stengel
Date: [ ] Vernon C. Maine, Reg. No. 37,389 or [ ] Scott J. Asmus, Reg. No. 42,269
CERTIFICATE OF FACSIMILE 37 CFR 1.8: I certify that this correspondence is being faxed to: Examiner Justin R. Fischer, at FAX #: 703-872-9306 , TEL #: 703-605-4397 on the below date.
Date: [ ] Debra A. Stengel or [ ] Scott J. Asmus, Reg. No. 42,269
Dear Assistant Commissioner:
This declaration is offered in support of the above application for patent.

37 CFR 1.132 DECLARATION OF CHARLES A. HOWLAND

My name is Charles A. Howland. My qualifications in the field of the invention are as follows. I hold a Bachelor of Science degree in Mechanical Engineering from Massachusetts Institute of Technology. My thesis work focused on extrusion methods for polymer processing. I have spent the last 20 years in industrial research focused on flexible composites and assembly. In addition to the last 11 years as Technical Director of Warwick Mills, I have worked in textile re-enforcement of tires, puncture resistant military tires and other advanced truck tire materials at Michelin Americas Research Corp and at assembly systems at Digital Equipment.

During the last 11 years my research group at Warwick has taken a leadership role in a range of difficult fibers based materials problems. These include the Vectran based crash bags for the Pathfinder, Mir and Beagle Mars missions for Jet Propulsion Lab. We have developed most of the Hull, Ballonet and heatseal tape materials for the current generation of Aerostat tethered blimps and the other military and commercial airships. We have patents issued and pending in these and related fields.

Here at Warwick Mills, we are leaders in the development of a new class of puncture resistant materials with applications in Tires, Gloves, Industrial Apparel, and Stab Resistant Vests. We hold pioneering patents in this art and continue to lead the industry in this materials class.

We have developed and hold patents in the use of these materials in law enforcement and industrial gloves, and safety suits for protection from ultra high-pressure water. We have extensive proprietary equipment, skilled staff, and considerable practical experience in fabricating and testing these types of materials.

The primary purpose of this declaration is to explain why the puncture resistance results achieved with the claimed invention for a tire anti-puncture device, particularly with respect to the use of low bulk modulus coatings that penetrate into the void space between fibers of the fabric, were unexpected and would not have been obvious prior to the invention, and certainly not obvious in the context of the cited prior art of McGee, RD'421059, Harpell'280, and Harpell'574.

The performance of this invention is governed by some puncture mechanics not well understood. There are a series of interactions with the woven fiber and the various coating materials that is not in any way obvious. Based on the objectives of the invention and the materials in question, a simple additive theory of each material's puncture resistance qualities would be expected to yield at least a useful expectation of their combined performance. For example, using 0.05 steel needle test method where:

- Uncoated fabric (UCF) puncture resistance in lbf = UCF
- Coating (C) puncture resistance in lbf = C

- Cover layer (CL) lbf =CL
- System performance predicted (SSP) would be expected to yield approximately the sum of the three:

SPP=UCF+C+CL

The optimization to which the Examiner alluded, with respect to a flexible puncture resistance material based on the McGee and other cited art in the rejections would then be based on selection of fabrics and coatings that have very high puncture results in their respective classes. Unexpectedly, this is not the result that was obtained in our testing.

Example #1

- 70/2 arimid fabric of 73x70 epi construction (style/1094)
- Coated and saturated with an approximately 2000 psi modulus nylon
- Felt cover layer
- Uncoated fabric puncture performance for s1094

UCF= 0.35lbf

- Coating puncture performance C < 0.05
- Cover layer CL=1.73
- Addition based performance prediction SPP=2.1
- System performance, Actual (SPA) SPA=4.28

As can be seen from this example the result in simple addition would be a puncture resistance of SPP= 2.08lbf. However, as shown above, the actual puncture performance is SPA = 4.28; greater than twice the expected result. This is seen even when the coating has a very low modulus and negligible performance on its own. The affect of even a soft matrix resin on a puncture resistance multiplies the affect of the woven design in this respect. Keep in mind that the coating, as stated in the claims, must penetrate into and occupy at least a portion of the void space between fibers for the fabric, in order to achieve this result.

Example #2

- 50/2 x 25/2 aramid fabric of 110x63 epi construction (style/1123)
- Coated and saturated with approximately 3500 psi modulus acrylic coating filled with carbide grain
- Uncoated fabric puncture performance for s1123 UCF=2.18
- Coating puncture C < 0.1
- System performance predicted SPP = 2.28
- System performance actual SPA = 4.71

As in the first example the results of a very soft matrix has an amplifying or multiplicative impact on the system performance. These results are not anticipated from the experience with harder higher modulus coatings. To use a coating that has little or no intrinsic puncture resistance to improve the resistance of the system would not be expected to yield these results. However in combination with fabrics of enough cover with the correct coating method as claimed, this unexpected improvement in puncture resistance can be achieved.

Example #3

- 50/2 x 25/2 aramid fabric of 110x63 epi construction (style/1123)
- Coated but not saturated with approximately 3000 psi modulus acrylic coating
- Uncoated fabric puncture performance for s1123 UCF=2.18
- Coating puncture C < 0.05
- System performance predicted SPP = 2.2
- System performance actual SPA = 2.4

As can be seen in this example if the coating is not allowed to penetrate and form a matrix with the woven, as claimed, the results of the first two examples is not achieved. The test results are consistent. We conclude that the interaction of soft coatings over the small dimensions in the fiber voids changes the characteristics of the individual components to yield the resulting, unexpected improvement in system behavior.

The undersigned declares further that all statements of his own knowledge made herein are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application of any patent issuing thereon.

Respectfully submitted this _____ 9/24/04

Charles A. Howland
Inventor/Applicant